



Organic matter flow in the food web at a temperate heath under multifactorial climate change

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Abstract:

The rising atmospheric CO₂ concentration, increasing temperature and changed patterns of precipitation currently expose terrestrial ecosystems to altered environmental conditions. This may affect belowground nutrient cycling through its intimate relationship with the belowground decomposers. Three climate change factors (elevated CO₂, increased temperature and drought) were investigated in a full factorial field experiment at a temperate heathland location. The combined effect of biotic and abiotic factors on nitrogen and carbon flows was traced in plant root → litter → microbe → detritivore/omnivore → predator food-web for one year after amendment with (15)N(13)C(2)-glycine. Isotope ratio mass spectrometry (IRMS) measurement of (15)N/(14)N and (13)C/(12)C in soil extracts and functional ecosystem compartments revealed that the recovery of (15)N sometimes decreased through the chain of consumption, with the largest amount of bioactive (15)N label pool accumulated in the microbial biomass. The elevated CO₂ concentration at the site for 2 years increased the biomass, the (15)N enrichment and the (15)N recovery in detritivores. This suggests that detritivore consumption was controlled by both the availability of the microbial biomass, a likely major food source, and the climatic factors. Furthermore, the natural abundance delta(13)C of enchytraeids was significantly altered in CO₂-fumigated plots, showing that even small changes in delta(13)C-CO₂ can be used to detect transfer of carbon from primary producers to detritivores. We conclude that, in the short term, the climate change treatments affected soil organism activity, possibly with labile carbohydrate production controlling the microbial and detritivore biomass, with potential consequences for the decomposition of detritus and nutrient cycling. Hence, there appears to be a strong coupling of responses in carbon and nitrogen cycling at this temperate heath.

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Resource Description

Communication:

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience:

audience to whom the resource is directed

Climate Change and Human Health Literature Portal

Researcher

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Extreme Weather Event, Food/Water Security, Temperature

Extreme Weather Event: Drought

Food/Water Security: Agricultural Productivity

Temperature: Extreme Heat

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Global or Unspecified

Health Impact:

specification of health effect or disease related to climate change exposure

General Health Impact

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content